

REMARKS

Applicants appreciate the thoroughness with which the Examiner has examined the above-identified application. Reconsideration is requested in view of the amendments above and the remarks below.

Abstract objections

Applicants have amended the abstract as requested by the Examiner to delete the title.

Drawings objections

Applicants have amended the drawings as requested by the Examiner.

Specification objections

Applicants have amended paragraph 0024 of the specification as requested by the Examiner to correct the spelling of "pair-wise."

Claim objections

Applicants have presented the claims as requested by the Examiner to remove the "C" notation from the claims.

Rejections under 35 USC §§ 102 and 103

Claims 1-3, 8-12 and 16-18

Claims 1, 3, 8, 9, 10, 12, 16 and 18 stand rejected under 35 USC § 102 as being anticipated by Robles et al. U.S. Patent Publication No. 2004/0005089. Claims 2, 11 and 17 stand rejected under 35 USC § 103 as being obvious from Robles in view of Papadopoulou et al. U.S. Patent No. 6,178,539. Applicants respectfully traverse these rejections.

Applicants have amended claims 1, 10 and 16 to add the subject matter of claims 2, 11 and 17, respectively, namely, the step of creating Voronoi cells around the spaced integrated circuit shapes. Applicants have also amended these claims to clarify that, in determining bisectors between adjacent ones of the spaced integrated circuit shapes, the bisectors comprise locus of points equidistant from edges of the adjacent spaced integrated circuit shapes and define shared boundaries of adjacent Voronoi cells. Support for these amendments are found in the specification at paragraph 0027 and in Fig. 1 of the drawings. No new matter has been added.

Applicants' invention employs the defined bisectors to create sub-resolution assist features between the adjacent ones of the spaced integrated circuit shapes. However, prior to creation of the sub-resolution assist features, it is important to create the Voronoi cells around the spaced integrated circuit shapes, and then create bisectors that define shared boundaries of adjacent Voronoi cells.

The cited Robles reference does not make any mention of Voronoi cells, and does not use bisectors that define shared boundaries of adjacent Voronoi cells. Robles placement of a sub-resolution assist feature centered between feature edges 330, 340 (Roble Fig. 3) does not comprise creating sub-resolution assist features along a bisectors that define shared boundaries of adjacent Voronoi cells. As defined in the amended claims, applicants' "bisector" is not merely a line "centered" between feature edges. Applicants' "bisectors" comprise locus of points equidistant from edges of the adjacent spaced integrated circuit shapes and define shared boundaries of adjacent Voronoi cells. In the case of the type of features edges 330, 340 in Roble's Fig. 3, such bisectors would end in a one-dimensional (1D) fragmented vertex of the type shown in Fig. 3 of the instant application, and described in specification paragraph 0030. Where one

edge ends at a point within the length of a parallel feature (as does the end of Roble's feature edge 340 with respect to feature edge 330), applicants' bisector would extend beyond the end of the edge that ends, as shown in applicants' Fig. 3 by vertex 156 that marks the end of bisector 150 that extends to the left of the end 142a of feature edge 143.

Roble simply makes no mention of any bisector that extends beyond the edge of his feature edge 340, to end in a 1D fragmented vertex. Accordingly, Roble does not disclose or suggest applicants' method as described in claims 1, 10 and 16. The Papadopoulou patent, cited by the Examiner against claims 2, 11 and 17, does not remedy the deficiencies of Roble.

The Papadopoulou patent does mention the use of Voronoi diagrams, but uses the diagrams to compute critical areas for shorts between different conducting regions of a layout. Papadopoulou does not use any boundaries of Voronoi cells to create sub-resolution assist features, let alone define shared boundaries of adjacent Voronoi cells as in applicants' claimed invention. Accordingly, one of ordinary skill in the art would not even look to combine the Roble and Papadopoulou references in the first instance.

Even if the references were combined, there is no suggestion in either Roble or Papadopoulou to create a bisector that comprises the locus of points equidistant from edges of the adjacent spaced integrated circuit shapes and defines shared boundaries of adjacent Voronoi cells. Roble does not disclose or suggest a "bisector" that extends beyond the end of a feature edge that ends within the length of a parallel feature edge, as applicants' invention would need to do to create a bisector under similar conditions. Papadopoulou does not disclose or suggest creating bisectors along shared boundaries of adjacent Voronoi cells. As such, one skilled in this art would not arrive at

applicants' claimed invention from the hypothetical combination of these references. Applicants submit that the rejection is based on hindsight only after reading applicants' only specification.

Claims 4, 13 and 19

Claims 4, 13 and 19 stand rejected under 35 USC § 103 as being obvious from Robles in view of LaCour U.S. Patent Publication No. 2002/0155357. Applicants respectfully traverse this rejection.

Dependent claims 4, 13 and 19 add the subject matter of identifying different types of vertices for the bisectors prior to creating the sub-resolution assist features, and prioritizing creation of the sub-resolution assist features in accordance with the type of vertex.

Since the definition of "bisector" has been modified in independent claims 1, 10 and 16, such definition carries to describe the "vertices for the bisectors" as recited in dependent claims 4, 13 and 19, respectively. LaCour mentions no "vertex" of a bisector, let alone a "bisector" as applicants' have defined. While LaCour does describe classifying scattering bars into priority groups, such classification has nothing to do with the type of vertices of bisectors, as applicants have defined. Therefore, claims 4, 13 and 19 would be obvious to one of ordinary skill in the art.

Claims 5, 6, 14, 15 and 20

Claims 5, 6, 14, 15 and 20 stand rejected under 35 USC § 103 as being obvious from Robles in view of Lucas et al. U.S. Patent Publication No. 2004/0248016. Applicants respectfully traverse this rejection.

Dependent claims 5, 6, 14, 15 and 20 describe extending at least some of the sub-resolution assist features beyond the bisectors on which they are created, and

extending at least some of the sub-resolution assist features beyond the bisectors on which they are created to connect to other sub-resolution assist features. Lucas has been cited to render obvious these methods.

Lucas makes no mention of extending sub-resolution assist features beyond bisectors as defined by applicants. Lucas does not disclose or suggest the extension of sub-resolution assist features along bisectors defined by shared boundaries of adjacent Voronoi cells. Lucas merely links sub-resolution assist features in a manner unrelated to applicants' claimed method. Accordingly, there is no disclosure of applicants' claimed method in the combination of Roble and Lucas.

Claim 7

Claim 7 stands rejected under 35 USC § 103 as being obvious from Robles in view of Frankowsky U.S. Patent Publication No. 2002/0182523. Applicants respectfully traverse this rejection.

Dependent claim 7 recites removing at least one of the sub-resolution assist features along the bisectors prior to finalizing the photomask layout. Frankowsky does not disclose or suggest the removal of sub-resolution assist features along bisectors defined by shared boundaries of adjacent Voronoi cells. Frankowsky merely removes scatter bars in a manner unrelated to applicants' claimed method. Therefore, there is no disclosure of applicants' claimed method in the combination of Roble and Frankowsky.

It is respectfully submitted that the application has now been brought into a condition where allowance of the entire case is proper. Reconsideration and issuance of a notice of allowance are respectfully solicited.

Respectfully submitted,



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